

**THE KAVERY ENGINEERING COLLEGE**  
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

*Fifth Semester*

*Electronics and Communication Engineering*

EC3551 – Transmission Lines and RF Systems

(Smith chart can be permitted)

*Regulations - 2021*

*Duration : 3 Hrs*

*Maximum: 100 Marks*

**PART – A (ANSWER ALL QUESTIONS) (Marks 10\*2=20)**

| Q.No | Questions                                                                                                            | BLT | CO | Marks |
|------|----------------------------------------------------------------------------------------------------------------------|-----|----|-------|
| 1.   | State the properties of an infinite line.                                                                            | RE  | 1  | 2     |
| 2.   | Mention the reflection co-efficient values for various load termination.                                             | AN  | 1  | 2     |
| 3.   | How will you make standing wave measurements on co-axial lines?                                                      | UN  | 2  | 2     |
| 4.   | Justify that the point of voltage minimum is measured easily in a transmission line rather than the voltage maximum. | AN  | 2  | 2     |
| 5.   | What is the need for impedance matching?                                                                             | RE  | 3  | 2     |
| 6.   | List out the advantages of smith chart.                                                                              | RE  | 3  | 2     |
| 7.   | Distinguish between TE and TM waves.                                                                                 | AN  | 4  | 2     |
| 8.   | Write the expression for cutoff frequency in a circular waveguide.                                                   | UN  | 4  | 2     |
| 9.   | Summarize the basic steps in the design process of RF amplifier circuits.                                            | AP  | 5  | 2     |
| 10.  | List the basic parameters of RF amplifier.                                                                           | RE  | 5  | 2     |

**PART – B (ANSWER ALL QUESTIONS) (Marks 5\*13 = 65)**

| Q. No | Questions                                                                                                                                                                                                                                                   | BLT | CO | Marks |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|-------|
| 11.   | a i Write a short note on reflection factor and reflection loss and give its expressions.                                                                                                                                                                   | RE  | 1  | 7     |
|       | ii With necessary steps show that the line will be distortion less if CR=LG.                                                                                                                                                                                | RE  | 1  | 6     |
|       | Or                                                                                                                                                                                                                                                          |     |    |       |
|       | b Discuss in detail about inductance loading of telephone cables and recall the attenuation constant, phase constant and velocity of signal transmission for the uniformly loaded cable.                                                                    | RE  | 1  | 13    |
| 12.   | a Analyze the dissipation less line and derive the input impedance of the dissipation less line, also deduce the input impedance of an open and short-circuited dissipation less line.                                                                      | AN  | 2  | 13    |
|       | Or                                                                                                                                                                                                                                                          |     |    |       |
|       | b i Examine why the reflection becomes undesirable in the transmission line.                                                                                                                                                                                | AN  | 2  | 5     |
|       | ii A transmission line has following parameters per km $R=15\ \Omega$ , $C=15\ \mu F$ , $L=1\ mH$ , $G=1\ \mu mho$ Find the additional inductance to give distortion less line. Calculate $\alpha$ and $\beta$ for this inductance added transmission line. | AN  | 2  | 8     |

|     |     |                                                                                                                                                    |    |   |    |
|-----|-----|----------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|
| 13. | a i | Formulate the expression for input impedance of a quarter wave transformer and mention its significance in impedance matching.                     | CR | 3 | 5  |
|     | ii  | Design a Quarter wave transformer to match a load of $200\Omega$ to a source resistance of $500\Omega$ which operates at the frequency of 200 MHz. | CR | 3 | 8  |
| Or  |     |                                                                                                                                                    |    |   |    |
|     | b   | Using double stub matching, test the complex load of $Z_L = 18.75 + j56.25 \Omega$ to a line with characteristic impedance $Z_0 = 75 \Omega$ .     | CR | 3 | 13 |
| 14. | a   | Derive the propagation of TE waves in a rectangular waveguide with necessary expressions for the field components.                                 | UN | 4 | 13 |
|     | Or  |                                                                                                                                                    |    |   |    |
|     | b i | Explain about transverse electromagnetic waves between a pair of perfectly conducting planes?                                                      | UN | 4 | 7  |
|     | ii  | Determine the expression of wave impedance of TE, TM and TEM wave between a pair of perfectly conducting planes.                                   | UN | 4 | 6  |
| 15. | a   | Elaborate the construction and the functionality of the bipolar junction transistor.                                                               | CR | 5 | 13 |
|     | Or  |                                                                                                                                                    |    |   |    |
|     | b   | Discuss on the construction and functionality of RF Field effect transistors.                                                                      | CR | 5 | 13 |

*PART – C (Marks 1\*15 = 15)*

| <i>Q.No</i> |     | <i>Questions</i>                                                                                                                                                               | <i>BLT</i> | <i>CO</i> | <i>Marks</i> |
|-------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|--------------|
| 16.         | a   | Explain in detail about the primary constants and secondary constants of a transmission line and bring the relation between them.                                              | UN         | 1         | 15           |
|             | Or  |                                                                                                                                                                                |            |           |              |
|             | b i | A line having characteristic impedance of $50 \Omega$ is terminated in load impedance $75 + j75\Omega$ . Determine the reflection coefficient and voltage standing wave ratio. | EV         | 3         | 7            |
|             | ii  | Explain the significance of smith chart and its application in transmission lines.                                                                                             | EV         | 3         | 8            |